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The Pennsylvania Guide to Hydraulic Fracturing, or "Fracking"

BACKGROUND



LINDSAY LAZARSKI/WHYY

Workers vacuum any water or fluids surrounding a frack site in Harford Township, Pa.

Slick water hydraulic fracturing or “fracking” is a technology used to extract natural gas, and oil, that lies within a shale rock formation thousands of feet beneath the earth’s surface.

Combined with another technique called horizontal drilling, natural gas companies are able to drill previously untapped reserves.

It’s important to note **the word fracking (which some spell as “fracing or frac’ing”) was coined by the industry** and refers to a specific stage in oil and gas development. However, with the increased publicity around the domestic oil and gas boom, the term fracking has often become synonymous with everything associated with the development of these resources, including the construction of wellpads, and all the related activity needed to support the industry, like pipeline construction and truck traffic.

The combination of fracking and horizontal drilling has resulted in a boom in domestic oil and gas production. Horizontal drilling allows one surface well to tap gas trapped over hundreds of acres. Once the conventional vertical drill hits the shale formation, it turns horizontally. Drilling can then occur in several directions, much like the spokes of

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a wheel. The well is cased with steel and cement, which is meant to protect gas and frack water from leaking out.

Explosives are placed at intervals along the horizontal section of the well to perforate the steel casing. These holes allow the gas, which is trapped in tight formations, to flow up the vertical section of the well. Under very high pressure, a combination of water, sand and chemicals is sent deep into the earth to create cracks and fissures in the shale rock. Those fissures are held open by the sand, allowing the natural gas to flow through those cracks, into the well bore and up to the surface.



Click on the image to the left to view Penn State Public Broadcasting's [interactive website](#) explaining the hydraulic fracturing process.

Wastewater from the process returns to the surface contaminated with some of those chemicals, as well as buried salts and naturally occurring radioactive material. That wastewater needs to be treated, or buried deep in the earth using

underground injection wells.

The cost of fracking a well can cost between \$3 and \$5 million dollars. Before a well is fracked, land needs to be cleared, leveled and prepared for a well pad. Each wellhead needs about 5 acres. Although a wellhead may sit on one leased piece of property, the extraction of the gas may take place beneath the land of numerous property owners. Initial drilling produces drill mud and drill cuttings. Some of that mud can be reused, but the cuttings often require disposal.

After a well is cased and cemented, a separate team comes to frack the well, which involves several different phases. These include the perforation of the horizontal section, injecting pressurized frack water, plugging that section of the well and moving on to another section. The frack water contains a proppant, usually sand, to keep open the fractures. It also contains chemical additives, perhaps the most controversial ingredients. Those additives include gels to add viscosity, acids that remove mud from the wellbore, biocides to kill microbes, surfactants to make the water slippery, and scale inhibitors.

The industry has an **exemption from the Safe Drinking Water Act**, and does not have to disclose the chemicals used. Critics say those chemicals could pollute water supplies, either through surface spills, or through leaks from poorly constructed wells. Not all of the frack water returns to the surface once the well starts producing. Some are concerned that even the frack water left more than a mile underground could, over time, migrate and pollute water supplies. Although the drilling companies are not required to disclose the chemicals, many have begun to do so on an industry sponsored website called [fracfocus.org](#). Information on the health and environmental impacts of exposure to drilling chemicals can be found on a website created by the **Endocrine Disruption Exchange**.

Debate rages over the safety of hydraulic fracturing. Industry and some elected officials will say fracking chemicals have never polluted any water supplies. **Cases of methane migration** due to poor casing construction have been confirmed, but industry often says the methane existed in drinking water supplies prior to drilling activity. And they say that technically, methane migration is not caused by "fracking." Recently, the **EPA released a report on water contamination in Pavilion, Wyo.** Federal environmental regulators linked drilling chemicals in the aquifer to fracking.

In addition to water contamination, some worry about the **amount of water needed to frack a well**. Fracking can also create small earthquakes if done along faults. But the big concern with earthquakes has come with the disposal of used frack water in **deep injection wells**.

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